



SIGNAL

A club since 1992



Since 1993



Since 1996

de N1NC

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NVARC Monthly Meetings

NVARC general meetings are scheduled for the third Thursday of the month at 2430 UTC (7:30pm, Eastern Time). Meetings will resume at the Pepperell Community center this month, and will also be available on Zoom

Non-members who are interested in attending via Zoom may send an email to meetings@n1nc.org requesting the teleconference details.

NVARC thanks **Medtronic, Inc** for providing the teleconferencing services under their employee volunteer support program for non-profit organizations.

This Month's Meeting

The October 2021 NVARC General meeting will be at the Pepperell Community center, and, simulcast via Zoom.

Ward Silver, N0AX, is scheduled to speak on the Yasme Foundation¹.

The Yasme Foundation a 501(c)(3) not-for-profit corporation organized to support scientific and educational projects related to amateur radio,

¹ <http://www.yasme.org>

including DXing and the introduction and promotion of amateur radio in developing countries.

Next Month's Meeting

The November NVARC meeting will consist of our annual QSL card sort. C'mon down to the Pepperell Community Center and lend a hand. It's easy & fun!

The President's Corner

de Bruce, K1BG

I'm hoping that the September meeting represented a watershed of sorts for the club and our membership: September was the first in-person NVARC meeting since the Covid lockdown halted face-to-face meetings in early 2020. It was the first meeting that was simulcast as well, via Zoom.

While many of us enjoyed our face-to-face meeting, there are members who choose not to attend in person, and others who Zoomed into our meeting that were either too distant to attend in person or were just "checking us out".

Regardless of how they attended, conducting a meeting whereby in-person and remote attendees can participate looks like it's here to stay!

I received positive feedback from both those who attended in person and those who were remote.

Jim, N8VIM, who has been arranging the Zoom sessions through his employer, Medtronic, has some suggestions which we will try to incorporate into October's meeting presentation (more on that elsewhere in this Signal). Since our presenter will also be remote, it should be interesting to see how it works out.

Equally interesting will be the November meeting. This is our annual W1 QSL Bureau QSL sort. It

begs the question: How can we hold this kind of meeting on Zoom?

Is there any benefit in doing this? It highlights the fact that, in my opinion, meetings held in-person have the added advantage of personal interaction which is missing from on-line venues.

NVARC had quite a presence at the recent North-east HamXposition, which was held in Marlborough on September 10th – 12th.

Our own Phil Ericson, W1PJE, was the Keynote Speaker at the Grand Banquet on Saturday night.

I was a speaker at one of the Saturday forums, giving my “CW Academy” pitch².

Also, new this year, non-profit organizations were allowed a table to promote themselves. Kudos to John, KK1X, for putting together a nice club table.

George, KB1HFT, had a large supply of newsletters on hand, and John provided club brochures. Most of these had been picked up by random show attendees by the end of the event.



Some work has been done to improve the performance of the 2-meter N1MNX repeater that the club uses for a variety of activities.

Having a healthy and vibrant repeater is important for a variety of club activities, not just the club net. The repeater has traditionally been used by the club for things like the Groton Road Race and the Squannacook River Race.

Based on positive results of tests done since the improvements were made, the club will re-start the weekly 2-meter net next Monday, October 18. I will be net control. Look for us on the N1MNX 2-meter repeater, 147.345+, PL 100.0 Hz, at 7:30 PM.

That’s all for this month. I hope to see you at NEAR-Fest or at the October meeting.

-de Bruce, K1BG

**On fixing a partially working
Command HF-2500
Linear Amplifier**
de John, K1JEB

I like to purchase non-working equipment and taking the challenge to making them work again.

² <https://cwops.org/cw-academy/>

I have been saving for a Linear Amplifier that would work on 160 Meters. I have a Drake L4, which I had fixed and upgraded to an “L4B”, but it does not work on 160 meters.

However, a Command HF-2500 Linear Amplifier came up for sale that was in my price range for a fixer upper. Thanks to Bruce, K1BG, for giving me a heads up on the availability of this amplifier.

I purchased it and I was told by the seller that he had used it a month earlier. That was good the news.



The Command HF-2500 amplifier undergoing initial tests after installing 4 new LED meter bulbs. The 3-ring binder is holding down the interlock switch.

However, upon getting it on the workbench and applying power, I notice a few problems:

1. The Plate Voltage Meter read 1,600 Volts and not the specified 2,700 Volts in the instruction manual.
2. The same meter when switched to Plate Current pegged full scale immediately. Ouch! Even when the amplifier was in Stand-By mode!
3. The 4 meter bulbs were burnt out.

Before anything further could be checked these two problems had to be investigated first.

While tracing the schematic in the User Manual I discovered that the PC boards did not match the ones in the manual.

After researching on Google I discovered that there have been many revisions to this rig, and also that Command Co. has traded hands 4 times!

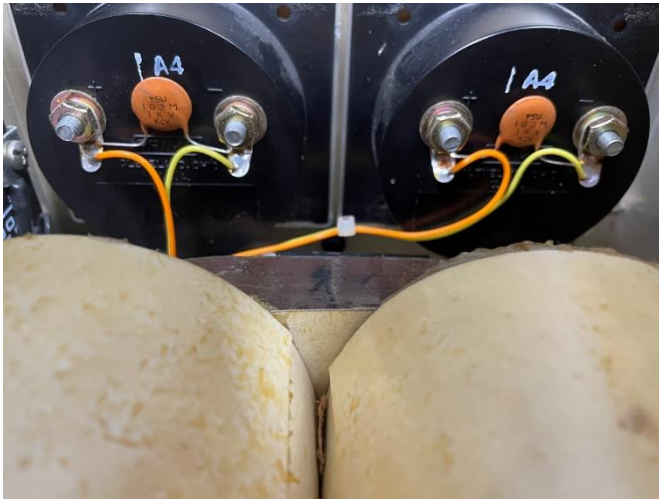
Palstar was the last company that made the HF-2500.

The version I purchased was originally built by Command. But, the records for the various revisions that had been made are lost. Ouch...

But I got enough information to trace out the Metering Circuits.

The amplifier is well built and is of a rugged construction. But it is very difficult to work on.

To replace the meter light bulbs, you need to remove the 60lb. Transformer!



The two meters are directly in front of the transformer. To replace the bulbs, I had to remove the transformer

The transformer leads have a Molex plug so one can quickly disconnect the transformer from the amplifier. Removal was conceptually simple.

There are 4 1/4in bolts holding the transformer to the chassis. The problem was dealing with the heavy weight and the tight spacing.

I was able to replace the bulbs with LEDs so I won't have to deal with this again.

Next is dealing with the plate volt / current meter. Unfortunately, the High Voltage circuit board is located inside the RF Deck.

This requires the removal of the entire RF Deck.

Command never made any instructions on how to take apart this amplifier. I found that to remove the RF Deck the front panel and the rear panels had to be removed first.



The front and the rear panels have been removed. The RF deck also has been removed.

The deck screws holding the RF Deck to the chassis were also removed.

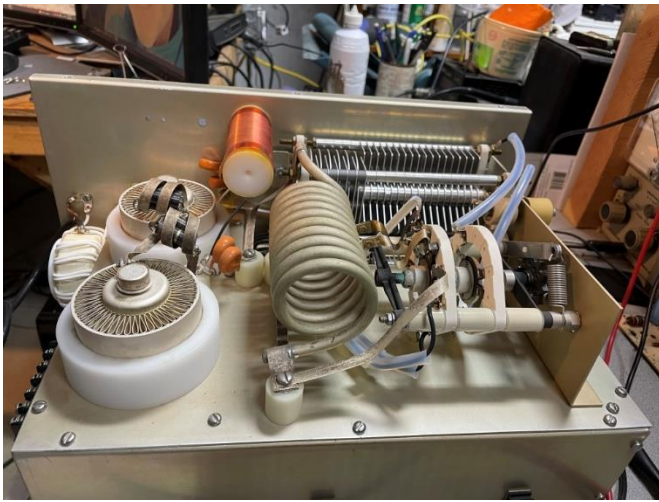
I took a lot of pictures with my iPhone so I can re-assemble the amplifier later.

All the wires coming from the RF Deck had screw terminals on a terminal block. So, no de-soldering was required.



The wire terminal block on the RF Deck. These wires had to be disconnected.

After removing the RF Deck, I found that the High Voltage PCB had been burnt by the heat of the filter capacitor equalization resistors (eight 50k 5-Watt resistors).



The removed RF Deck



The power supply PCB. Note the burn marks from the capacitor equalization resistors.

Between the large brown power resistor and the diodes are the voltage divider resistors: 3 1Meg and one 150K ohm resistors make up the meter voltage divider.

I worked at a TV Repair shop in High School. When we encountered this problem with burnt PCB, the common practice was to drill holes into the PCB to prevent the dark carbon sections from conducting and also allowed air to pass to cool the heated parts. I did this to the HV PCB in the amplifier. I also replaced the 50K 5-Watt resistors with new resistors.

Next, there are three 1Meg and one 150K ohm resistors that make up the voltage divider for the Plate Volt Meter. Also, since they were 2-Watt Carbon resistors that were 30 years old and stressed with high voltage over time, I knew they would likely be very much out of tolerance.

Checking the 1Meg resistors with an ohmmeter, they measured as follows:

1.4M ohm, 1.6M ohm and 2.2M ohm. The 150K measured at 170K.

No wonder the Plate Volt Meter readings were way off. I replaced them with 3- Watt 2% flame proof resistors.

While I had the RF Deck out, I checked everything else and all checked good. The amplifier was really clean.

I re-assembled the amplifier. Then I did the fire and smoke test.

No Smoke or fire when I turned it on! Good so far.

There is a 3-minute timer that allows the tubes (two 3CX800-A7) to warm up. A Green Power LED turns on after 3 minutes and then you can flip the Standby Switch to use the amplifier.

I noticed that it came on in 2.5 minutes rather than 3 minutes. So, the timing capacitor on the NE-555 timer chip probably dried up over the years. I will get to that another time.

Then I checked the Plate Volt Meter and it was indicating the correct 2,700 Volts: Awesome!

Switching the meter to Plate Current now indicates 0 mA. Again, Awesome!

I hooked up my iCom IC-745 transceiver to the amplifier.

The amp requires that a radio be able to sink 12V at 60mA to flip the amplifier into TX mode.

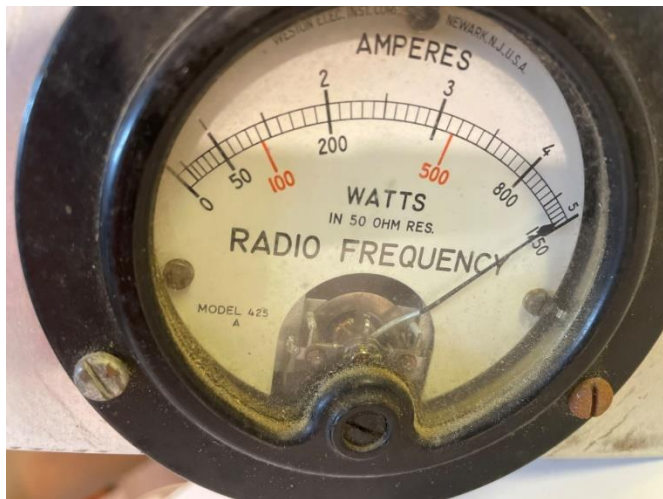
The IC-745 uses an internal relay so this is not a problem. But for my Kenwood TS-590SG this is a problem.

When the Kenwood goes to TX it raises the relay signal from 0 Volts to 12 Volts at only 10mA OR you can set the menu to sink 12 Volts to 0 Volts at only 10mA. But the amplifier requires a 60mA sink! Nuts.

So, I set out to check everything using the IC-745 first.

Using a SWR meter between the radio and the amplifier I can check to see if the amplifier input network is working. I installed a true RMS 1,250-Watt RF Watt meter between the amplifier and my Heathkit "Antenna" 50-ohm Dummy Load.

I first checked the amp on the 160 meter band. When tuning up I got 1,250 Watts output with 40mA of Grid current. Wow, it works!



Bench Watt meter indicating 1,250 Watts Output.

Then, I checked 80, 40, 20, 15 meters and got 1,250 Watts on all bands.

The SWR between the radio and the amplifier was in the 1:12 and 1:14 range on all bands. That is not bad.



The bench setup used to do the final checks.

Next, I added a second RCA jack above the Relay RCA jack on the back of the amplifier, and added a transistor inverting switch using a 2N3904 and a 4.7K ohm base current limiting resistor with the collector going to the original RCA Relay jack.

This will allow the TS-590 to sink 1mA of current and thereby switch the amp to TX mode. Now, I can use either, the Kenwood TS-590 and the IC-745 (or any iCom) radios (both plugged in at the same time but, not used at the same time).

The Command HF-2500 is a quirky Amplifier. The tank circuit is unconventional. The pi network converts the 2500 ohm plate impedance to 200 ohm.

Then a 4:1 balun is used to convert from 200 to 50 ohms. The manual indicates this is to reduce the harmonic output producing a cleaner signal. I think it was done this way to reduce the size of the variable load capacitor.

The other quirky thing is that in most tube amplifiers, as the frequency increases the TUNE capacitor is decreased in a clockwise direction. Also, as you increase the loading with the LOAD capacitor one rotates again in a clockwise direction. Not with the HF-2500.

The TUNE is clockwise but the LOAD is counter-clockwise. The nice touch is that the TUNE and LOAD control knobs have a 5:1 Jackson drive which makes tuning much easier especially at the higher frequencies.

The HF-2500 amplifier comes from the factory with a table of pre-set settings for pre-tuning of the TUNE and LOAD capacitor for each band. Unfortunately, I did not get that from the seller. But I was able to create one.

But creating one using a pre-set chart from a resistive 50 ohm dummy load is one thing; using the settings with a real antenna is quite another.

I took a big chance with this amplifier. But I got very lucky.

Cheers!

de John, K1JEB

The History of Entry-Level Licensing Part 1

de Bruce, K1BG

As many of you know, one of my interests is understanding the history of entry level licensing in the United States.

I believe that the relevance of the entry level license is key to attracting new people to the amateur radio, particularly youth.

Amateurs typically think that the licensing conditions that existed when they were first licensed were always that way. The truth is that the entry level license requirements change on a regular basis.

In this first installment, I'll discuss the time period between what I call the dark ages, through the 19-teens and up through the late 1920s.

Before 1912, there were no licensing requirements in the United States. Marconi had established commercial service between the shore and ships at sea, and navies experimented with communicating between shore stations and ships.

During this time, amateurs were accused of interfering with both commercial and military stations.

Remember, state of the art technology at the time was spark gap transmitters. The transmissions were very broad in frequency, and receivers were not at all selective, so it was as if everyone was using one big party line.

The typical range of an amateur spark gap transmitter was perhaps 30 or 40 miles. Both commercial and military operators had little patience for the interference that they felt was being generated by amateurs.

Amateur radio was considered a youth hobby, and the young amateurs were thought of as pests.^{3,4} There were several attempts to legislate and regulate amateur radio before 1912, but none of them were successful.

The Titanic disaster of 1912 changed all of this.

For the first time amateur radio was regulated, and amateurs were restricted to spectrum of "200 meters and down". This was an attempt to separate amateurs from both commercial and military users.

To get an amateur license, there was a five word per minute code requirement and a very simple test, consisting of rules and regulations, international laws, and describing to your Department of Commerce examiner the equipment you intended to put on the air.

If you lived further than 50 miles from an examiner, you could send him a letter stating that you knew the material, and request a license be returned to you in the mail. Licensing was very simple and the requirements were very simple.^{5, 6}

Technology during this time was very primitive. A spark gap transmitter consisted of perhaps a dozen components. The technology was not well understood, by either the amateur or the examiner.

³ <http://earlyradiohistory.us/1908stp.htm>

⁴ <https://earlyradiohistory.us/1911jun.htm>

⁵ <http://www.earlyradiohistory.us/1912reg.htm>

⁶ <http://www.earlyradiohistory.us/1914reg.htm>

On top of this, if you did not live near a commercial or a military installation, unlicensed amateur stations were generally ignored by the authorities.

Remember, commercial stations meant Marconi, and military stations were naval stations.

So, unless you lived close to the coast, no one really cared what you did.

"Only two classes of stations are totally exempt from the license: First, those whose apparatus is for receiving only, second, those whose influence does not extend beyond the state, or does not interfere with the reception of radiograms from beyond the state".⁷

World War I temporarily halted amateur radio communications.

When amateurs returned to the airwaves after the war, the department of the Navy asked that amateurs have a code requirement of 10 words per minute in order to get an amateur license.

My belief is that the reason for this was because most of the good CW operators used by the Navy in World War I were former amateurs who had already achieved a code speed of 10 words per minute before enlisting in the Navy.

The early 20s also saw an explosion in radio technology. Spark gap was replaced by continuous wave or CW technology for transmitting Morse code, which had much greater range. Receiver technology also advanced considerably during this time.

Technology was advancing, as was the description of the equipment you intended to put on the air.

Several other things also happened during the 20s. Amateur radio began to become regulated on an international basis. The radio act of 1927, which created the Federal Radio Commission, was one of the acts that instituted these new regulations.

Somewhere in the late 1920s, the amateur exam went from a verbal test before a Department of Commerce examiner to a written exam taken before a Federal Radio Commission examiner. Still, the exam was fairly simple.⁸

⁷ <http://earlyradiohistory.us/1913wl.htm>

⁸ <https://worldradiohistory.com/Archive-Radio-News/20s/Radio-News-1929-10-R.pdf> page 320

In my next installment, I'll talk about what happened in the 1930s and 1940s.

As a side note, every once-in-a-while while doing research you come across something that you find tremendously interesting and humorous at the same time. In doing research for this article, I came across this interesting piece.

The contributions and genius of Edwin Armstrong are well known. One of his professors at Columbia University, Professor J.H. Morecraft, published an article in the July 1922 edition of Radio Broadcast called "What Everyone Should Know About Radio History".⁹

In the article, Morecraft says the following of Armstrong:

"During 1911 and 1912 E. H. Armstrong was studying for the degree of Electrical Engineer at Columbia University; he was not an especially brilliant student, in fact in many of his courses he did rather poorly. The writer knows because Armstrong was one of his students. The characteristics of alternating current machinery in general, did not prove very enticing to the young student, not because he was lazy or indifferent but because he had a hobby--and a vision."

We share his hobby, and have greatly benefitted from his vision. You'll have to read the rest of the article to find out more!

de Bruce, K1BG

Some Very Interesting Videos on Planetary Magnetic Fields
de Joe, K1YOW

I love it when my astronomy and ham radio hobbies collide. I thought I would share a couple of videos, good for watching when the Patriots or Red Socks are not playing. LOL.

Magnetic field lines affect our radio signals: auras, sporadic E, CME's from solar flares and their geomagnetic storms, etc. And just like our radio signals can be polarized by magnetic fields, so can light.

This first video has a good front-end showing the Earth's magnetic field, the sun's magnetic field

⁹ <http://www.earlyradiohistory.us/1922knw.htm>

and how CME's happen, and extends everything out to the solar system and galaxy.

How Magnetism Shapes The Universe

<https://www.youtube.com/watch?v=H4xrVzd65Q>

This next video gets into how the Earth's magnetic field was created and how it changes over time.

Is Earth's Magnetic Field Reversing?

<https://www.youtube.com/watch?v=51usJ74pPP8>

And I have been out there collecting photons again. Here is a picture of Jupiter taken at 107x



on October 07 2021 at around 7:30 PM EDT. Conditions on a scale of ABCDF were around C minus with some humidity. Hum, given the weather lately (clouds, drizzle,

rain), I may be spending more time on the air. LOL.

Enjoy,

de Joe, K1YOW



Have **YOU** paid your NVARC Dues? See: <http://n1nc.org/Members/Roster> for your renewal month.

Treasurer's Report

Income for September was \$30 in membership renewals. No expenses were recorded, leaving a net income of \$30 for the month.

The downsizing items donated for auction by AA1VX netted the Club \$680.

Per precedent, these funds have been credited to the NVARC Community Fund. The Community Fund has been used to make donations to benefit the communities in which NVARC members live. Examples include Amateur Radio books for libraries and a donation to the Town of Pepperell to benefit the Community Center. Bank interest from the Community Fund does accrue to the General Fund.

Current balances:

General fund	\$2,617.09
Community fund	\$6,628.25

As of 7 October we have 35 members who are current with their dues and 40 renewals outstanding. Several members have October renewal dates.

Renewal months are in the member list on www.n1nc.org in the Member's area; check yours on <http://www.n1nc.org/Members/Roster>.

Thank you to those of you who mail your renewals or use PayPal without a reminder.

To pay membership dues via PayPal see the instructions at <http://n1nc.org/Members/dues>.

If you are joining ARRL or renewing your membership please consider letting Ralph send in the paperwork for you. The Club will buy the stamp and will get a commission from ARRL. As a Special Service Club, the ARRL expects a majority of Club members to also be ARRL members. Contact Ralph for further information if you need it.

de Ralph, KD1SM

Board Meeting 7October2021

There were 2 membership renewals. No expenses were recorded: \$30 income for this month. Bruce, K1BG, raised \$680 from the AA1VX downsizing sale which will be added to the community fund which grew to \$6,628. The general fund is now \$2,617. There are many members that still need to renew their membership.

George, KB1HFT, distributed many copies of the Signal at the recent the Ham Exposition.

On Facebook there were 61 followers and 54 likes since September 11th.

Bruce distributed some text concerning the "New Ham" QSL program. However, Bruce would like some input from others. Bruce got permission from the Billerica Club to copy the Billerica Card and modify it for NVARC use.

The guest speaker on October 21 will be Ward Silver, N0AX, who will talk about the Yasme Foundation.

Doing the QSL Sort in November.

December will be a Social Night with Homebrew Night.

January is Short Subject Night.

Fred Harris may make a presentation at one meeting between January and April.

Mike Murphy WU2D will present at one meeting in that same time frame.

The board thought the simulcast of the club meeting went very well. Thanks to Jim Hein, N8VIM.

The AA1VX sale still has some items that did not sell. Bruce will post remaining items on the Reflector.

There was a good showing for the table setup and for our guest speaker W1PJE at the New England Convention.

When asked about the N1MNX repeater status, Ralph said that no further work had been done after changing to a different 2m antenna and he is still accepting performance reports. He is aware that further improvements should be done.

Bruce and Jim met with David Querze (Pepperell Emergency Management Director) last week for a location to conduct licensing classes.

Saturday 8am morning Breakfast at Tiny's is doing well.

de John, K1JEB

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Join NVARC! Annual membership dues are
\$15; \$20 for a family.

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Contact us on the N1MNX repeater.
442.900 (+), 100Hz
147.345 (+), 100 Hz
53.890 (-), 100Hz

This newsletter is published monthly. Submissions, corrections and inquiries should be directed to the newsletter editor: editor@n1nc.org.
Articles and graphics in most PC-compatible formats are OK.

Editor: George Kavanagh, KB1HFT

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